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## **Hygrothermal performance of buildings — Calculation and presentation of climatic data —**

### **Part 6: Accumulated temperature differences (degree days)**

*Performance hygrothermique des bâtiments — Calcul et présentation  
des données climatiques —*

*Partie 6: Différences accumulées de la température (en degrés par jour)*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15927-6 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 89, *Thermal performance of buildings and building components*, in collaboration with Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 2, *Calculation methods*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 15927 consists of the following parts, under the general title *Hygrothermal performance of buildings — Calculation and presentation of climatic data*:

- *Part 1: Monthly means of single meteorological elements*
- *Part 2: Hourly data for design cooling load*
- *Part 3: Calculation of a driving rain index for vertical surfaces from hourly wind and rain data*
- *Part 4: Hourly data for assessing the annual energy use for heating and cooling*
- *Part 5: Data for design heat load for space heating*
- *Part 6: Accumulated temperature differences (degree days)*

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## Introduction

Accumulated temperature differences are a relatively simple form of climatic data, useful as an index of climate severity as it affects energy use for space heating.

Calculation or estimation of accumulated temperature differences in this part of ISO 15927 is based on the concept of a base temperature. The base temperature reflects the point at which buildings begin to need heating to maintain the required internal temperatures. This is the external temperature below which the heating plant is assumed to come into operation. For some purposes, such as development of energy policy, the need is for a single base temperature that can be taken to represent an average value for the whole built stock and overall climate. For other purposes, it is better to determine a base temperature appropriate to an individual building and time of year.

This part of ISO 15927 meets these needs by including both exact and approximate methods of determining accumulated temperature differences to both standard and variable base temperatures. Some methods include the possibility of a threshold temperature (e.g. a daily mean air temperature lower than the base temperature, above which accumulated temperature differences are not counted). This approach is found in certain national methods of computation. It is, however, not covered in this part of ISO 15927 because it is considered to be less flexible than the methods given, in which accumulated temperature differences are assessed for a base temperature appropriate to the thermal performance of the building (taking account of other climatic conditions such as solar irradiation).

Accumulated temperature differences computed and presented in accordance with this part of ISO 15927 are suitable for various purposes including the following:

- a) providing an index of climatic severity as it affects energy use for space heating (the comparison use);
- b) monitoring the amount of energy used by a heating plant, and thus its efficiency (the energy management use);
- c) comparing the actual energy consumption for heating in a specific period with the consumption in a standardized period in order to determine the measured rating (the energy modelling use);
- d) predicting the economic consequences of different levels of energy efficiency (e.g. through thermal insulation) for the building stock as a whole or for different classes of building (the energy policy use).

Energy management [list item b)] requires new accumulated temperature difference data at regular intervals, such as meteorological station data or data representative of a climatic region, calculated to standard base temperatures, published for each month of the heating season as soon as these can be computed from verified meteorological observations.

Comparison, energy modelling and energy policy [list items a), c) and d)] require meteorological station data, data representative of a climatic region or mapped data, collected over many years (possibly giving extremes as well as mean values), to typify the severity of the climate of a locality, area or region. For list item b), accumulated temperature differences are best suited to modelling the energy performance of relatively small buildings with simple heating systems and controls, using "steady-state" thermal analysis. Modelling the performance of larger or more complex buildings can require more extensive climatological data sets, such as full or short "test reference years" which are outside the scope of this part of ISO 15927.

In principle the equations in this part of ISO 15927 can be reversed to deal with accumulated temperature differences for assessing energy use in cooling or air-conditioning buildings ("cooling degree-hours" or "cooling degree-days"). However, as the air conditioning demand depends as much on solar gain and external humidity as temperature, the results are not a reliable index of energy demand.